

ON THE

CLASS OF MEDICAL LITERATURE

MOST NEEDED AT THE PRESENT DAY.

Addressed to Medical Students.

BY

HORACE DOBELL,

MEMBER OF THE ROYAL COLLEGE OF SURGEONS;

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ERRATA.

- Page 6, col. 2, line 15 from top, for "Agenatus," read "Ægineta."
- " 13, " 1, " 22 " "professions," read "profession."
- " 14, " 1, " 3 " "sense," read "sense;"
- " 14, " 1, " 36 to 39 " "thirdly" down to "potassium," read "thirdly,
the change, viz. the formation of scarlet crystals of biniodide of mercury."
- " 17, " 2, " 36 " "but on the other hand," read "on the other hand."
- " 18, " 2, " 41 " "fact," read "facts."
- " 23, " 2, " 8 from bottom, after the words "with the works," insert "of Cuvier or Owen. In physiology, there is nothing to refer to till the days of Galen (and he lived after the 'philosophical period'). We have nothing, then, to compare with the works."



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ON

MEDICAL LITERATURE,

&c. &c.

CHAPTER I.

ALTHOUGH we have not now the pleasure of being associated in a Medical College, yet I hope that, as long as we are endeavouring to mature the knowledge of our profession, the first germs of which were acquired during our hospital studies, we may consider one another in the light of fellow students. It is in this light that I address to you the results of considerable thought, devoted to a subject which appears to me of the utmost importance.

The first object of every student is to become thoroughly acquainted with the diagnosis and treatment of diseases, as they are at present known; but with this, surely, we shall few of us be content: if we stop here, we leave our science still in its imperfection. I believe it must be our ardent desire, as it is our honourable ambition, to extend the knowledge of disease in paths which are yet unknown—to extend the influence of treatment over maladies now deemed incurable; thus to add honour to our already noble profession by answering more fully its benevolent object.

We must be well aware that the task we set ourselves is not easily to be mastered—that many have laboured hard in the same field, yet have found but little of the treasure which they sought—that many have commenced the search and left it in despair—that the labours of some have been worse than useless, for they have done injury to the cause. We shall not, then, run heedlessly to the work, neither expect that a little labour will accomplish it, nor

hope always to see the way clearly before us.

I have presumed that we have all this wish and intention, as far as in us lies—to raise our profession, and to elevate the science of medicine; but certainly this design will have a very slight prospect of progressing further—very little hope of ever coming into execution—however strongly it may be held, if we start on our career with nothing but the project in our heads, and have not decided by what means it is to be carried out, and in what manner these means are to be applied.

Before we can improve any thing several provisions must be made—viz., 1st, we must know the condition in which the thing to be improved already exists; 2d, we must form some standard of perfection as appertaining to it; 3d, we must discover what parts are necessary to raise it from its present to its perfect condition; 4, we must know the order in which the deficient parts may be safely supplied. Having ascertained these points, we are in a condition to work an improvement, and may proceed with a degree of confidence without which it will be difficult to find the energy for patience in the task. It is evident that our first business in the present case is to make ourselves duly acquainted with the state of medical and surgical knowledge in our own day—that is, to ascertain the present condition of the thing to be improved; and it is important that we should lose no time in doing this,

so that every future step we take may be in the right direction. When the matter of this first proposition has been duly considered, and something like an unanimous opinion concerning it arrived at, we shall not be long in laying down a standard which we may call perfection in our science; and then commences the important and interesting business of determining the materials necessary to raise it to that standard.

The history and progress of every science may be readily divided into periods, and in each case the character of these will be chiefly distinguished by the character of the *Literature*, by which I mean the recorded observations and reasonings peculiar to that particular space of time. These records, which we term "the literature of the period," must have been made by some individuals then living, and following the particular science to which they relate. It is evident, therefore, that men have a power to form the character of the literary age in which they live. This may be confirmed by a reference to history, in which we find the names of certain men invariably mentioned in connection with certain periods, to designate the phases of their literary progress: of this we have striking examples in sacred history, but we have also enough in the history of science.

Thus we find the "Pythagorean age" distinguished by Pythagoras and his disciples; the dogmatism connected with the names of Hippocrates, Aristotle, and Plato; the scepticism of Permanides and Pyrrho, which in medical science became the empiricism of Philinus, Serapion, and Heraclitus; the methodism associated with the names of Asclepiades, Themison, Coelius Aurelianus, and of Leucippus and Democritus. Then we have the period characterised by the writings of Galen—a period in the history of medical science taking its character, and that one of such importance, from the exertions of one man. In later years we have the "spiritual philosophy" connected with the names of Descartes, Leibnitz, and Kant; the "sensual philosophy" of Bacon, Locke, and Condillac. Numerous other instances might be mentioned where the character of a literary age is due to the exertions and writings of a few individuals; but it is needless to enumerate them, as we have seen enough to establish the fact; and this fact is to us of most serious import and of the deepest interest, in so far as we learn from it that, if we labour for our science, we must be careful with what end the labour is performed; for, unconsciously to ourselves, we may give a wrong direction to the literature of medicine, and thus retard its

progress; or, on the other hand, we may, by labouring with care and circumspection, and by combined efforts, give a valuable character to the literature of the period in which we live, and assist in bearing on towards perfection.

I have endeavoured to show that, in order to raise and perfect the science of medicine, we must first determine its exact present condition. We have seen that the present condition of the science being determined, something more is still necessary before an improvement can be made. A knowledge must be gained of the deficient parts, the parts necessary to make it perfect. And further, I have asserted that these parts can only be safely supplied in a certain order; that, in consequence of this, it is necessary to determine what stands first in this order, which is the first part to be supplied, the first step towards perfection. Having done this, we are prepared to take the step, and when the step is taken we have worked an improvement. And lastly, we have seen that the steps of past ages in science have been taken by a few individuals who have agreed to walk together; that, whether the step were to improvement or degeneration, by some few men *combining in their efforts* the step has been made, and the record of it, handed down to us now, gives the character to a period in the history of science. These steps have for the most part been made by men of rare talents, and often of high genius; and to this, doubtless, they owed much of their power, added to the circumstances of unity of object and of system in their actions which characterised the day in which they lived.

But perseverance in study, clearness and calmness in thought, energy of mind, careful, unprejudiced reasoning, with patience in investigation, stimulated by an honourable ambition, may, I believe, supersede genius: therefore, should we lack bright and rare talents, we need not despair; for, by the combination of many lesser talents, we may become more powerful than a few men of genius: and if we unite in determining the necessities of our profession, and in the formation of a design by which those necessities may be answered; if we determine what is the first step to be taken in the improvement of our profession, and what are the means by which it is to be taken; if we unite in the determination to exert these means, one and all of us, towards the same object, we shall certainly accumulate a vast power within ourselves, for our number is not small. We shall then, when scattered abroad in the world, form parts of one great machine, acting over a wide space,

yet with one accord towards one object.

In the next place I must enumerate some facts and circumstances which appear to indicate, or assist in discovering, the present condition of medical and surgical knowledge. The idea we entertain of the present condition of anything which has existed for a number of years is to a certain extent independent, and refers only to its exact state at the time of examination; but to a much greater extent it is relative, and considers the state at the present time in comparison with conditions which have existed in past years, and with those which may yet arrive. It is to the present condition of medical science in this latter sense --i. e. in comparison with what it has been, and yet may be—that I shall now direct attention. For this purpose it is necessary to review the periodic history of our profession during the greater part of its existence, which must, unfortunately, be briefly done in these papers. Several arrangements have been adopted by different authors in describing the rise and progress of medicine; but the one which appears to me most clear, practical, and complete, and especially the most useful for our present purpose, is that of M. Renouard, in his late work "*Histoire de la Médecine*;"* and I believe that the best thing I can do will be to give a concise abstract of that part of his book which considers it. In the first place he divides the history of medicine into three "ages," and each of these ages he again divides into a certain number of "periods," making in all eight. The first age is called the "age of foundation," and includes four periods. The first of these, which M. Renouard calls the "primitive" or "instructive," commences at an indefinite time, and terminates at the fall of Troy, about 1200 years before the Christian era. "This period," he says, "which corresponds to the first infancy of human societies, is surrounded by profound obscurity, and mingled with a multitude of fables. It embraces an indefinite period of time during which medicine could not be said to constitute a science, but consisted of an undigested collection of experimental notions vaguely described, and often disfigured by a series of incomplete traditions. We can understand that such a state of things would persist for a longer or shorter time in the different countries of the earth, in proportion to the more or less rapid progress made by the inhabitants of these countries in the career of civilisation.

With Greece, who has transmitted to us the most beautiful and precious monuments of ancient medicine, the primitive period finished with the destruction of Troy."

The second of these, which is called the "mystic or sacred period," extends from the fall of Troy to the dispersion of the Pythagorean society, about the year 500 B.C. "During the space of about 700 years, which this historical period embraces, medicine underwent in Greece its first transformation; from domestic and popular, as it had been, it became sacerdotal and enveloped in a cloak of mysticism. Until then we had seen princes, officers, and even shepherds, gain reputation by their ability in this art; but after the Trojan war we hear only of consultations given in the temples under the name of the divinity, or at some celebrated altars—such as those of Charonium and Trophonius." "It is probable," says M. Gauthier, "that the reading of the inscriptions made by the sick in the temples, and the habit of seeing a great number of diseased people, would in the end give a certain medical education to the priests."

"We come next," says M. Renouard, "to an epoch in which the art of healing suffers a new metamorphosis, alike interesting to the historian and to the philosopher, and not less beneficial to humanity." . . . "The scientific monument of this difficult art is about to arise in grandeur and majesty, harmonising little by little in all its parts." This period, which is the third, finishes at the foundation of the Alexandrian Library, in the year 320 B.C. "We have now arrived at an epoch when science cast off the veil of mystery and revealed its secrets to the open day. The priests, who had been so long in the possession of the learning of the people, allowed the scientific sceptre to be wrested from them by the philosophers, and reserved only for themselves exclusive despotism over the sacred rites." "It is worthy of remark, and has not escaped the attention of ancient observers, that the inhabitants of Asia, after having founded the first elements of the arts and sciences, and having brought them to a certain degree of development, at this period were themselves arrested in the way to perfection, or even retrograded; while the inhabitants of Europe, who entered much later on the career of civilisation, quickly passed their ancestors, and were themselves raised to a height which the others had never been able to attain."

The fourth, which M. Renouard designates the "anatomical period," extends from the foundation of the Alexandrian library, 320 B.C., to the death of Galen in

* *Histoire de la Médecine, depuis son Origine jusqu'au 19ème Siècle, par le Docteur P. V. Renouard: à Paris, 1846.*

the year 200 of the Christian Era. In concluding the description of this period, he observes, "we have seen medical studies, already flourishing in the isle of Cos under the successors of Hippocrates, receive a new impulse by the foundation of the school of Alexandria, and attain suddenly in this city to a degree of prosperity until then unheard of. We have marked some of the circumstances which were coincident with this happy revolution, such as the foundation of a great library and of a museum of natural history, open, if not to the public, at least to all the studious men who came to dwell in the capital of Europe." "Then the dissection of human bodies, which among any other people could only be practised clandestinely and with peril, was not only authorized but even encouraged by sovereigns superior to the prejudices of their age. By this conjunction of circumstances the school of Alexandria became the most famous in the world for the natural and medical sciences." During this period, "anatomy and physiology had made the most considerable progress; internal and external nosography, medical and surgical therapeutics, had also acquired a great degree of perfection. Under the head of theory, medicine had made remarkable progress: in the place of some general perceptions, and incomplete attempts at systematisation, which one meets with in the works of Hippocrates, the period under consideration presents us with complete systems, of which the parts, carefully co-ordinated, adapt themselves more or less successfully to the various forms of disease and to the details of practice."

We next come to the second great division, according to M. Renouard: having finished the "age of foundation," including the "primitive period," the "mystic," the "philosophical" and the "anatomical" periods, we enter the "second age," the age of "transition," commencing with the fifth period of medical science, called the "Greek," which begins at the death of Galen in the year 200 A.D., and finishes with the destruction of the Alexandrian library, 640 A.D.

In the time of Galen people still dissected animals, and this Professor informs us that he made his anatomical demonstrations upon apes, of which, he says, "the conformation approaches very nearly to that of man." "Sometimes, indeed, the army physicians obtained permission to open the bodies of barbarians which they took from the field of battle; but by degrees the use of dissection was entirely lost, and people no longer studied the conformation of the human body, except from books. This

abandonment of anatomy no doubt contributed much to the degeneration of the healing art in this period, but other causes acted not less powerfully; in the first place, the rapid extension of christianity, which disorganised the pagan schools and engaged so much of the attention of men's minds; in the second place, the few who remained attached to the cultivation of the natural sciences, fascinated by a vicious method, sought only for the explanation of natural phenomena in the writings of the ancients, not daring to allow any changes in the received doctrines. Two men only, Alexander and Paulus Aeginetus, in the course of more than four hundred years, showed a little originality, the one by enriching internal pathology and therapeutics with some observations, the other by adding to surgery some notable improvements; but although this period was unfertile in scientific progress, it was not in social improvements."

The next period in the "age of transition," and the sixth in the history of medicine, is called by M. Renouard the "Arabian period:" it commences at the destruction of the Alexandrian Library, 640 A.D., and terminates at the end of the fourteenth century. "Three great events," says M. Renouard, "occurred during the Arabian period, and in some degree resumed the march of the human mind. 1st. The Arabian nation, until then obscure, and almost a stranger to the progress of civilization, passed rapidly from a half savage state to the first rank of polite nations. . . . 2nd. The Greek nation, which for so many ages had marched at the head of civilised nations, let the laurels drop one by one from its ancient crown. It sank, by a slow but continual descent, to the last rank of modern people. 3rd. The western part of the Roman empire, subjugated by barbarians from the forests of Germany and Scandinavia, fell into utter darkness during the first years of this period. . . . "During the 12th and 13th centuries, the governments of Europe regulated themselves, and acquired stability; liberal institutions were erected—the spirit of the northern people disengaged itself little by little from the rust of ignorance, and by the end of the Arabian period we deserv already some brilliant streaks in the horizon of European nations, and medicine participated in this progressive movement. . . . "Here finishes the 'age of transition,' or the 'middle' age."

We now enter upon the third age, "the age of renovation," according to M. Renouard, extending from the commencement of the 15th century to the present

day, and the first period in this age, the 7th in the history of our science, is the "erudite," comprehending the 15th and 16th centuries. "This age, which embraces a space of little more than four hundred years,—that is to say, about a third of the duration of the preceding age,—affords, nevertheless, to the history of the sciences in general, and to that of medicine in particular, materials the most numerous, the most varied, and the most interesting. The spirit of the western people, so long plunged in a kind of torpor, roused itself little by little, and seemed to have gained by the repose an extraordinary vigour: soon breaking its gothic bonds it advanced in every direction with youthful ardour. Some mounted the scale of centuries—to search over the remains of ancient sciences, to restore them, to devote to them a sort of cultivation—others exerted themselves to associate ancient with modern ideas, and to raise upon this double basement the monument of human knowledge; others, at length, more hardy, or more timorous, did away with the past—rejected tradition, and pretended to construct a scientific edifice solely from materials of new formation." After considering this period at length, M. Renouard concludes by saying, "the historical period, the picture of which we have just considered, offers to us one of the most interesting spectacles. We have seen the human mind, so long enslaved by a lethargic sleep, gradually arouse itself, and mark its first steps by discoveries of the highest importance; the love of letters spread in proportion as the means of instruction multiplied. Science, confined in the cloisters during the middle age, became secular as in the time of Hippocrates, of Plato, and of Aristotle; but with more numerous and powerful means of propagation: the first effect of the expansive movement of intellect was to call the attention of the learned world towards the primitive sources of the beautiful and the true: they exhumed from the dust of the convent libraries the remains of Greek literature, and substituted them little by little for the Arabian, the degenerate child of the former. Soon the monuments of ancient science suffered no longer from the ever-jarring ambition of the human mind; submitted to a criticism more and more clear-sighted and severe, these monuments showed forth a good number of defects, which much enfeebled the respect which had existed for these precious relics. Then, adventurous and impatient spirits attempted to overthrow the entire edifice of human knowledge, and to rebuild it in a

day; but their work, the fruit of an imagination exalted even to disease, supporting itself neither upon reason nor upon experience, crumbled down before the light of discussion. . . . Some men, however, knew how to combine the culture of ancient traditions with the love of novelty,—they understood that to reform would be better than to destroy, and that no change is justifiable but that which establishes a progress, or an amelioration; consequently they contented themselves with proposing partial modifications of the ancient doctrines with the object of perfecting not of annihilating them."

"Lastly, the eighth period embraces the 17th and 18th centuries, and is called the 'reformatory period.' In this we see the systems of Aristotle and Galen resist the premature attacks of the partisans of the occult sciences, and regain the great majority of minds by means of some partial modifications. The long duration of these systems, the almost unanimous accordance of great men of antiquity in their favour, formed a more respectable precedent than people had yet generally learned to disregard. It is not astonishing, then, that men the most eminent in science preferred them to the confused and ill-elaborated theories of those who cherished occult doctrines. . . . "Nevertheless the domains of the natural sciences extended from day to day; observation had enriched them during two centuries with a multitude of new facts, which ill accorded, or did not accord at all, with the accredited doctrines. The moment approached when the necessity for a radical reform was about to be felt in nearly all the branches of human knowledge. Some men, whose knowledge equalled their genius, were about to appear to take the direction of the intellectual movement, and to substitute for the derelict theories of the schools theories more new, more powerful, and harmonising better with the collection of phenomena: to the culture of the ancients there was about to succeed an immoderate desire to cast off their yoke, to get free in some way from their too long tyranny." "This," says M. Renouard, "is why I have given to this period the name 'reformatory,' which, if I do not mistake, perfectly characterises the general tendency of the mind—the dominant thought—the pre-eminent fact, of the epoch." "In a professional point of view," says our author, at the conclusion of his work, "the history of medicine has presented us with four distinct phases; 1st, a patriarchal phase, which corresponds to the origin of societies; an epoch when the head of a family united in his hands

all power, and was the depository of all tradition ; 2d, a sacerdotal phase, which reigned a long time in Egypt, which flourished in Greece, from the time of the Trojan war to the time of Hippocrates, and which reappeared in Christian Europe during the middle age ; 3d, a free lay phase, the worst of all, as respects the dignity

and morality of the profession ; 4th, a legal or organised lay phase, the most perfect of all the professional forms known down to the present day, the best appropriated to the actual state of Europe, the most favourable to the progress of science and art."

CHAPTER II.

The conclusion to be drawn from an examination of the history of medicine. Division of knowledge into three classes. Circumstances under which the study of medicine has been conducted. General character of medical knowledge in the present day ; the class to which it belongs. Standard of perfection in medical science. Nature of the knowledge required to raise medical science from its present to a perfect state.

THE history of the science of medicine which has now been briefly reviewed, is sufficient for our present purpose : it does not, however, treat of the exact period in which we live ; this has been omitted by M. Renouard for sufficient reasons, which need not be here enumerated. From this history, and more deeply from the perusal of detailed accounts, one pleasing impression cannot fail to be made upon the mind—that our profession has continued to improve from age to age ; that, from the first traces of medical knowledge, from the time the idea of treating diseases first arose in the human mind down to the present day, there has been a gradual increase in the amount of information possessed on these matters. Although there have been periods, as we have seen, when the science of medicine seemed to suffer degeneration—times when no movement, either in advance or in a contrary direction, appeared to be made ; yet we observe that, in the end, it has proved that an improvement was being effected—in some cases that the state of apparent inactivity was a sort of period of incubation, to be followed by the production of some great advance in scientific knowledge. Thus we have seen, during the first five centuries after the fall of Troy, that science appeared to be sunk in utter darkness, if we were to judge from any *public* changes in its progress ; but the termination of this period of silence was marked by the dispersion of the followers of Pythagoras, and the well-known flood of light which then burst upon the scientific world. We have observed the obscurity of science, the absence of improvement, during the “mystic period,” when the practice and study of medicine were confined to the temples ; but how was this silence broken—but by the voice of Hippocrates ! The records of disease, of its symptoms, and of every discovery in its treatment, handed down from

father to son, among the priesthood, during scarcely less than five centuries, at length became the property of the Hippocrates family ; and by Hippocrates the Second, the renowned of Cos, these records were unveiled, and, with the addition of his own valuable observations upon them, were laid before the world.

In some cases the apparent degeneration of medical science, the apparent retrograde in its course, has been only the period occupied by a transfer of knowledge from nation to nation,—from those by whom it had been carried as far as their powers were then capable of, to those who were fitted to bear it further onward towards perfection. Thus we have seen the transfer of scientific knowledge from the Asiatic nations, among which it had flourished for a certain number of years, into Europe, there to be carried on for a few centuries until the inhabitants of Greece, in the course of four hundred years, appeared to have exhausted their energies, to have grown tired of the study of the sciences, and, among others, of medicine. Anatomy was neglected ; their attention was turned to other themes ; their minds occupied by religious controversies, and medical science fell again into obscurity. There appeared to be a degeneration ; but the mind of the Arabian people, less occupied, and just prepared to seize with avidity upon the novelties of science, saved them from oblivion ; and during a considerable period of time the study of medicine was carried on among the Arabians with considerable ardour, and the names of Razes, Halli-Abbas, Avicenna, and Albucasis, became connected with new improvements in medicine ; while the literature of Greece was in a great measure preserved in the Arabian language. At length Europe rose refreshed from her long sleep, displayed new vigour, took back the learning of her earlier days ; the literature of Greece was restored with indefatigable zeal, the knowledge of the Latin authors gathered together ; noble discoveries were made, all assisting in the cultivation of the sciences and of enlightenment : and, in a few years, we see the nations of Europe, rich in scientific literature, marching far in advance of the rest of the world.

It is evident, therefore, from a careful examination of the subject, that there has been a steady and constant progress in

medical and surgical knowledge; and if it be asked what is the knowledge of the present day, I reply it is all that 3000 years have heaped together—a mass of knowledge almost incomprehensible: and when we consider this we shall not be surprised that it is so ill-arranged. To say that we have before us the accumulated knowledge of thirty centuries conveys but a vague notion of the state of medical science in the present period. An acquaintance with facts is knowledge. An acquaintance with principles, the result of inductions from facts, is knowledge. An acquaintance with deductions drawn from general principles is knowledge. There are, then, three classes of knowledge. Knowledge may partake of one, or more, of three distinct characters; and, in order to arrive at any just estimate of the state of medical and surgical knowledge at the present day, we must, in the first instance, determine the character of the knowledge possessed on these subjects, and decide to which of these three classes it belongs.

From the earliest ages those who have studied medicine or surgery have done so for the purpose of practising the art of healing; the consequence of this is, that each has in turn observed for himself the phenomena of disease, endeavouring to impress them upon the memory, that each particular assemblage of symptoms, to which some name has been given, and which has then been called a disease, may be well recollected. Medical science has not been studied by men who saw but little of sickness, and had much time for considering the import of the observations made by others, but by those who practised the art; and it has been studied the most by those who practised it the most,—therefore by those who most often witnessed the phenomena characterising each malady, but who had the least time for attending to anything but the fruits of their own observation.

The natural and necessary consequence of these circumstances is, that those who have distinguished themselves by contributing the most largely to medical and surgical knowledge have passed the greater part of their time in collecting facts concerning disease; and it is only the result that we might expect, that the writings of any one of these men should consist chiefly of an enumeration of these facts; it is as natural to expect that many of such writers would record similar facts, and this has been the case; the same phenomena have been recorded by different persons again and again, and each, perhaps, has mingled with them some new phenomenon—something which he has been the first to observe and to record. This has gone on for years; every

man, or nearly every man, who writes a book on medicine or surgery, repeats the same process; and hence it has come about that an immense number of facts have been recorded, and that these are as scattered as they are numerous. It is evident that the phenomena of disease impress the mind and arrest the attention much more often and more strongly than the treatment adopted for the cure of the malady. The phenomena of disease may be observed by everybody—by the sick person himself first, and by his attendant to a very great extent. It is from these two sources that the physician or surgeon obtains much of his knowledge of the condition of his patient. Whether the case be treated or not,—whether the phenomena can be interpreted or not,—whatever the theories in the mind of the practitioner, however little his knowledge of symptoms and their import—there are the circumstances of the case; the hot skin, the deranged intellect, the impaired motor power, the defective secretion, the pain, the changed colour, the cough, the troubled breathing, the anxious countenance, or whatever it may be—these are the mere objects of sense; they as readily impress the mind as the objects of nature are reflected in a mirror, and, therefore, are likely to be the most frequently recorded—recorded by the ignorant and by the learned—by the thinking man and by the mere observing man—by the practical man and by the theorist—by all they are capable of being recorded with considerable accuracy. There is, then, at the present day, the whole mass of facts concerning the phenomena of disease which have in various places and at various times been accumulated since men first visited the temples of Esculapius to write upon the walls the particulars of their afflictions.

Galen made a great name, which time has not decayed. He was the first who directed attention to *anatomy*, the first who made great discoveries in this part of our science. He had many disciples, who followed diligently in his steps. He has had disciples ever since his death; and in the present century anatomy is cultivated with extreme care, and for the most part by those studying the medical profession. There have been immense improvements in the knowledge of anatomy worked during the last century; and this knowledge is like that of the phenomena of disease, it is an acquaintance with the objects of sense, an acquaintance with things which any human being may see who has diligence to search and eyes that are not blind. The knowledge of anatomy, so great at the present day, is, then, a collection of *facts*.

Morbid anatomy.—The practice of examining bodies after death for the purpose

of observing the changes worked in parts by disease, almost unknown to the ancients, has during the last two centuries become more and more common, and at the present day is carried to a very high degree of perfection, examinations being made of all parts of the body with a scrupulous accuracy; and the improved knowledge of normal anatomy allows the changes of disease to be definitely marked. A knowledge of morbid anatomy, like that of normal anatomy, consists in an acquaintance with objects of sense: from this source we have again a new tribute of facts.

The Microscope.—Both medicine and surgery owe much to the microscope: within the 17th and 18th centuries, but particularly in the past portion of the 19th century, great additions to our knowledge have been made by this means—additions which could not have been made without it: but the microscope can only add to our acquaintance with objects of sense—it reveals only things already existing, but hidden from our sight, and, in doing this, it has added largely to the accumulation of facts.

Chemistry.—To the attention chemists have directed to the study of the constituents and products of the body, under states of health and of disease, we owe much. It has been, like the microscope, a revealer of things hidden from observation without its assistance; but we shall find that, although the revelations of chemistry are not exclusively objects of sense, like those to which we have already referred, yet that the largest tribute that chemists have made to the science of medicine is not in principles, but in an addition to the accumulation of correct facts.

The stethoscope is, to a great extent, during life, what morbid anatomy is after death. Heavy indeed is the debt which medicine and surgery owe to the stethoscope, for the addition of numerous invaluable facts to the knowledge of the present day.

Physiology teaches the functions of the organs and structures revealed by anatomy—certain influences, properties, qualities. Here, again, we have an addition of facts. Physiology has marched boldly of late, and the number of new facts added to the knowledge of medicine and surgery is proportionately large.

We have seen, then, that the diligence of men in the study of diseases, the perseverance of those who have followed anatomy, physiology, pathology, chemistry, &c., the assistance rendered by great discoveries, have all acted principally with one effect—they have all added, atom by atom, to the vast store of facts. In a view of the matter so cursory as the present is obliged

to be, it would be useless to attempt to point out all the numerous varieties in the character of our medical and surgical knowledge, and it would not be of any great advantage that we should do so, for it is the *general* character which is important for us to learn: the *general* characters are all that we can possibly learn of past ages; and, if we are able to judge of the causes and effects of these, we shall also be able to do the same of the present age, if we ascertain its general character. This I have endeavoured to do, and I have called attention to a few of the circumstances which lead me to the conclusion, confirmed, I believe, by every day's experience, that the general character of medical and surgical knowledge, in the present day, consists in a very correct acquaintance with those points which may become subjects of observation—with the objects of sense. In short, that the knowledge of the present day belongs to the first of the three classes I have mentioned—an acquaintance with facts.

I shall assume that we have now solved our first problem, and ascertained "the present condition of the thing to be improved:" my next duty is to point out some standard of perfection in medical science. The object of medicine and surgery is to cure disease. An idea of perfection in a science having this object would be realised if we possessed—1, a knowledge of the human body in a condition of health; 2, a knowledge of the phenomena indicating this condition during life; 3, a knowledge of the human body under every condition of disease; 4, a knowledge of the phenomena indicating each of these conditions during life; 5, a knowledge of the processes by which these changes of disease are worked; 6, a knowledge of the causes of these processes; 7, a knowledge of the means by which these causes of diseased processes may be removed; 8, a knowledge of the means by which the processes may be arrested when set in action. Assuming this to be correct, we have now established our second proposition—viz., "a standard of perfection in the thing to be improved." It remains for me to point out the links deficient in the chain—the absent knowledge between the present and perfect condition. My estimate of the state of medical and surgical knowledge at the present day consists of those points discoverable by the senses, and these will include numbers 1, 2, 3, 4, of the constituents of perfect medical science—viz., a knowledge of the conditions and symptoms of health, and of the conditions and symptoms of disease. Of course, I do not suppose that we are *perfect* in these four points; but, as I have stated before, we

must speak generally ; and I believe that, in that sense, these may be taken as the points in which we may be called perfect. Now, if we subtract these four items of knowledge from the eight by which I have represented perfect medical science, we shall ascertain definitely how much and what there is to be done to arrive at perfection : we shall learn exactly " what parts are yet deficient ;" and, unfortunately, they form a very serious prospect ; for there are still remaining, after this subtraction—

1st, a knowledge of the processes by which diseased changes are worked ; 2d, of the causes of these processes ; 3d, of the means by which these processes may be arrested ; and 4th, a knowledge of the means by which the causes of disease may be removed. And now we have established three of our propositions—"the present condition of the thing to be improved," "The ideal standard of perfection," "The parts yet wanting to bring the thing from its present to a perfect state."

CHAPTER III.

The state of the medical world in the present age—additional evidence of the necessities of medical science—popular toleration of quackery and inconsistency of medical men explained—the means by which we gain acquaintance with processes and causes—the means by which the deficient knowledge in medical science may be supplied—apparent objections—answer to these based upon history.

WE have watched the dawn of reason upon the science of medicine, and seen the clouds of superstition with which its sky was overcast gradually driven back to the horizon, and finally dissipated, when the sun of enlightenment rose higher in the heavens; we have watched the morning of our science, in its dim grey light, open slowly into day; many storms have broken the sunlight, many shadows fallen and threatened to obliterate it for ever, but these have passed away, and the early day has become bright and beautiful, the light of reason and enlightenment have brought to view the new buds just rising from the roots of knowledge, and declaring that the spring-time of our science has arrived. This is the state in which we find the world of medical science in our own day, and the great question is now before us. We are looking into life—the great duty of that life as regards our professions lies freely opened to our view—the task which an honourable and praiseworthy ambition has set before us.

As yet I have trusted to reason alone to point out the nature of the knowledge needed by our profession, and it is meet that we should pause here, to consider if my conclusion is confirmed by other evidence, by that evidence which testifies to the necessities of each age, as it passes in the circle of time; viz., the current cry in the world, and the objects of our daily observation; and, in the present case, we shall find that these confirm the conclusion to which reason has conducted us. Why have we seen so long the reign of quackery tolerated and upheld? Why have we heard so much of all the “pathies” with which society has been noisy; of “hydropathy,” of its numerous disciples and its benefits, boasted so highly for a period and then forgotten? Why have we

seen so many converts to “mesmerism,” as a cure for diseases? Why have we heard of certain remedies, professed to cure whole hosts of maladies of contrary natures? Why do we hear of “homœopathy,” and see its disciples increase so rapidly as they have done of late? Why do we see men who have studied their profession declare that the practice of medicine is a farce, and our power over disease a mere fantasy? Why do we see enlightened men treat similar cases on opposite principles? except that the causes and processes of disease, and the means of arresting or removing them, are so little understood, it is proof sufficient that we are wanting in a knowledge of the causes and treatment of disease, and it behoves us deeply to consider how this knowledge may be supplied. I proceed, but with great diffidence, to answer this difficult and abstruse question.

The knowledge we so much need has been seen to consist in an acquaintance with the processes concerned in the production of changes found in disease, and an acquaintance with the causes to which these processes are due; also, we require to know the means by which these may be arrested or removed. It is of the two former points that I speak first, the latter being deferred to a future page.

Let us look into our own minds, to consider the nature of this required information. In the first place it consists of processes, that is to say of actions; and in most instances a process will consist of many simultaneous actions. Now, with but little trouble, we may recollect many processes with which we are acquainted, and thus in our minds, as I before said, we may consider the nature of this acquaintance; and it will be found that our acquaintance with processes is not like that we have with objects of sense—we shall find that we have seen, heard, or felt—we have in some way been made aware by sensation of the facts connected with the process; we have seen the matters concerned in the change, we have perceived those existing before and after the process, but the process itself has been too subtle, or too complicated, or too minute, or too rapid, or too something, with the notion of which we excuse ourselves for not observing

it; while the truth is, that it could not be observed because it was not an object of sense, and by continuing in the same contemplation of these familiar matters we shall at length find that, in truth, the notion we gain of a process, the acquaintance we obtain with it, is through an act of induction, from the facts concerned in the change, not by observation, which is sensation. I may illustrate this, for the sake of greater clearness, by some simple examples. We throw two bodies, one a stone, the other a piece of cork, into a vessel containing water—the one sinks to the bottom, the other floats on the surface—and the level of the water rises in the vessel. Here we may observe the state of the vessel and of its contents before the operation, the descent of the one body and the ascent of the other, and the rising of the water in the vessel. These are the objects of sense, the facts concerned in the process which we can observe; but the process by which the change is effected cannot be ascertained by other means than an act of reason, by a review of the exact facts, and by an induction from them. To take another example: if a solution of iodide of potassium be dropped on some crystals of bichloride of mercury, their colour is changed from an opaque white to a bright scarlet; all that observation can teach in this matter are the facts:—first, the presence of white crystals of bichloride of mercury; secondly, the addition of iodide of potassium dissolved in water; thirdly, the change in the colour of the crystals from white to scarlet; fourthly, the result of the change, viz., the formation of chloride of potassium. But the process by which the change was effected could not be observed, and must be detected by induction. Again, if we take a bladder filled with cold air, and expose it to heat, it bursts; all that observation can teach us in this case is the existence of the bladder, that it is filled with cold air, that heat is applied, and that after a short time the bladder bursts and its contents escape, that the air is elevated in temperature and occupies a larger space than it did before the operation. Careful observation can teach us all this, for these are facts, but an acquaintance with the process by which the change takes place can only be obtained by assembling these facts, and reasoning upon them.

It would be tedious to multiply examples of a principle so self-evident. I shall therefore assume it to be admitted that an acquaintance with the nature of processes cannot be gained by observation, and may be gained by reason. And we will now pass on to the subject of causes; the means by which we gain an acquaintance with the causes of processes. It is evident,

that, as all change is the result of some process, the cause of the process, and the cause of the change it effects, will be the same; therefore, for the sake of brevity, I shall speak of causes as causes of change, not of processes. The cause must precede its effect; therefore, in the case of change, we may see the thing before the change takes place, and we may see it in its changed condition; but we cannot see the cause of change and the change at the same time: it follows, therefore, that we must resort to some other source than observation to learn the cause of any change presented to us. And let us again look into our own minds, and observe to what source we have ordinarily resorted in discovering causes with which we are acquainted, and it will be found that, as in the case of processes and their nature, it is to reason, and not to observation, that we look for the discovery of cause. Thus, to take a familiar example, the way in which we discover the cause of a shadow. Now this matter is so simple and so familiar that at first thought it will appear that we learn the cause of shadow through our senses alone, by observation; but more careful thought will show us that it is not so: *e. g.* From a level surface of the earth we observe a body rising perpendicularly, as a tree for instance, and if the light come from either side, the opposite will be in shade, and a shadow of the perpendicular body will be seen upon the earth on that side, while the other side and all around is light. Observation will, in this case, teach us just so much as this,—first, that there is a level surface of the earth; secondly, that there is a tree rising from one part of it; thirdly, that there is light, and that the light comes from one particular point; fourthly, that the side of the tree turned towards the point from which the light comes is enlightened; fifthly, that the opposite side is not enlightened; sixthly, that the portion of earth between which and the light stands the tree is also dark; seventhly, that all surrounding parts of the earth are light. Having these facts presented in connection by observation, the induction leading to the discovery of the cause is almost forced upon the mind, and we at once conclude that if the tree were not there, there would not be the shadow, and, therefore, that the tree is the cause of the shadow. But observation without reason could not possibly teach this. Observation can only tell that while the tree stands there, there is a shadow, and that where that shadow is not, there is light; but it cannot take the next step, short as it seems, and say that light would be where darkness is if the tree were removed; because, as we before stated, while the effect is an object of sense, the cause as such can-

not be ; and while the cause is an object of sense, the effect as such cannot be : the only means of appreciating the two in connection is through reason. To take a second example—the cause of sound. If we strike a drum with a drum-stick, observation may acquaint us with the fact that the stick struck the drum, also with the fact that we heard a sound almost immediately ; and in this case the cause and effect follow so rapidly, that they seem to be connected by observation. But the link between the stroke and the sound—that is to say, all which constitutes them cause and effect—is supplied by reason, and cannot proceed from any other source. I might continue to present examples in confirmation of this principle to the end of time ; but as they are as familiar as they are numerous, I need not lose time by their recital. I shall therefore consider it granted that the cause of any process by which a change is worked *cannot be learned by observation, but may be learned by reason.*

It has now been shewn and illustrated, that while the existing conditions of parts or things can be learned by observation, the processes by which such conditions are brought about, and the causes of these processes, can only be learned by reason. It is evident that this principle applies equally to the most complicated cases, and to the simple examples which have been employed for convenience in demonstration. Therefore we have theoretically answered the first part of the question proposed ; for we have come to the conclusion, that a “knowledge of the causes and processes of disease may be supplied by inductive reasoning.” I am well aware that even upon a careful view of the subject there appear to be many grounds open for objection ; and it is only natural that those who see these grounds,—who do not agree with my conclusion,—should refer to the experience of past ages as a testimony to the fruitlessness of philosophy applied to medical science : it is my duty, therefore, to offer some answer to these objections ; and in doing so I hope to bring evidence which will testify to the correctness of my conclusion, because I have formed it upon the basis of the very past experience to which I am referred.

It will be remembered that in the sketch of the history of medical science which I have given, I referred to one epoch under the name of “the philosophical period,”—a space of time extending from the dispersion of the Pythagorean Society 500 years B.C. to the foundation of the Alexandrian Library 320 years B.C. This short period of 180 years was distinguished by the names of Hippocrates, Socrates, Plato, Aristotle,

Anaxagoras, Empedocles, Democritus ; all of whom, except Socrates, devoted their attention to the study of medicine in the pursuance of their philosophy ; and if *they* were unsuccessful in the application of philosophy to medicine, it may appear presumptuous to suppose that its application is likely to be successful in the present day : but let us pause before making such a conclusion, to consider if it would be just. I have referred to men of high genius—to great philosophers whose names have come down to us laden with the accumulated honour of more than twenty centuries—honour richly merited by men who were the first to think boldly, to labour sedulously for the advancement of the sciences, and to make public the results of their meditations. But because men of noble genius and industry applied their powers to an attempted advancement of science, it does not follow that the attempt was rightly made ; and when we contemplate the circumstances under which it was made—the state of knowledge at that time—the opportunities offered to men of improving the understanding and directing the current of the thoughts,—we shall feel that it would have been perfectly miraculous had these philosophers proceeded successfully in their application of reason, and we shall be prepared to learn that those who have studied the subject most deeply have come to the conclusion that the labours of the philosophers whose names I have quoted were all but fruitless in their application to the sciences. Thus Prof. Whewell says,—“The methods and forms of philosophising which we have described as employed in the Greek schools failed altogether in their application to physics. No discovery of general laws—no explanation of general phenomena, rewarded the acuteness and boldness of these early students of nature. Astronomy, which made considerable progress during the existence of the sects of Greek philosophers, gained, perhaps, something by the authority with which Plato taught the supremacy and universality of mathematical rule and order ; and the truths of harmonics, which had probably given rise to the Pythagorean passion for numbers, were cultivated with much care by that school. But after these first impulses the sciences owed nothing to the philosophical sects, and the vast and complex accumulations and apparatus of the Stagirite do not appear to have led to any theoretical truths.” “This assertion hardly requires proof, since, in the existing body of science, there are no doctrines for which we are indebted to the Aristotelian school. Real truths, when once established, remain to the end of time a part of the mental treasure of man, and may be dis-

cerned through all the additions of later days. But we can point out no physical doctrine now received of which we trace the anticipation in Aristotle in the way in which we see the Copernican system anticipated by Aristarchus, the resolution of the heavenly appearances into circular motions suggested by Plato, and the numerical relations of musical intervals ascribed to Pythagoras.*

"Thus the Aristotelian physics cannot be considered as otherwise than a complete failure. It collected no general laws from facts; and consequently, when it tried to explain facts, it had no principles which were of any avail. The same may be said of the other schools of philosophy; they arrived at no doctrines from which they could adduce, by sound reasoning, such

facts as they saw."* And this failure of the Greek philosophy was as complete in its application to medical science as to the more exact sciences to which Prof. Whewell particularly refers. But, although physical science received so little advancement from the labours of these renowned philosophers of the Greek schools, in succeeding ages vast improvements have been made in these very sciences through inductive philosophy. *Why, then, I would ask, may not medical science receive some part of its much-needed improvement from the same source?* If the failure of the Greek philosophy in other departments of science was no argument *against* the success of the philosophy of later years, the failure of the Greek philosophy in medical science is no argument against the success of philosophy in the present day.

* History of the Inductive Sciences, by the Rev. W. Whewell, M.A., vol. i. p. 68. Parker, 1837.

* Ibid.

CHAPTER IV.

Foundation for the conclusion that inductive philosophy is the means required to supply the deficient knowledge in Medicine and Surgery—The effect of the ancient philosophy—its failure to produce new truths—this failure explained—three causes assigned—its effect upon the general progress of science witnessed in the succeeding period—The means by which discoveries in science have been made—examples—The discovery of the circulation by Harvey an inductive act, &c.—Comparison of the state of knowledge and of the human intellect at the present time with their state in the “philosophical period”—commenced—Object of this comparison explained.

I HAVE stated my conclusion—that inductive philosophy is the means required to supply the needed knowledge in medicine and surgery—to be founded on the experience of the past, and I will endeavour to show the nature of this foundation. I derive the support chiefly from three sources. First, the effect of the ancient philosophy; secondly, observation of the mode in which great discoveries have been made in medical science since that time; thirdly, comparison of the present state of medical science and of the human intellect, with their state during the “philosophical period.” I must say a few words under each of these heads; and first, of the effect of the ancient philosophy. It may appear to some that I have already stated sufficient on this point in quoting Dr. Whewell’s opinion, that the Greek philosophy was a complete failure; but this is not enough. Dr. Whewell speaks of the attempt made to advance science, the effect of the labours of Aristotle and his contemporaries in their application of inductive reasoning, and this he states to have been equal to no effect at all; the sciences neither retrograded, nor did they advance, during the “philosophical period:” therefore the failure in this sense is clearly proved. But there is another very important view of the matter which we have not yet considered; one which, I think, should always be taken when considering the history of periods: I mean, a view of the effects of the Greek philosophy, not as to whether it answered the end for which it was adopted, not as to the correctness of theories then constructed, or the truth of axioms then held,—but a view of the Greek philosophy in the aggregate,—of all the philosophers, all their sys-

tems, all their failures, and all their successes, classed together as constituting the “philosophical period” in the history of the sciences, and of medical science in particular. Now, as the effect cannot be coincident with the cause, but must follow it, if we wish to learn the effect of the “philosophical period” we must not examine that period, but the one which succeeded it; and it is extremely interesting to do so in the present case, for the effect so forcibly arrests our notice,—*That which followed the “philosophical” was the “anatomical” period.* The effect of the failure in philosophy was to call for anatomy; and from this we learn that those who for 180 years had employed such noble talents in endeavouring to improve a science by reason, had, by the endeavour, pointed out that the materials for that reason to work with were yet deficient. It is a common opinion, and has also been held and supported by those who have studied the subject, “that the Greeks disregarded experience, and spun their philosophy out of their own thoughts alone; and this is supposed by many to be their essential error,—that the chief cause of their failure was the neglect and ignorance of facts.”* Now, with respect to the sciences in general, we cannot doubt that many facts were wanting; that, indeed, all those were deficient which have been discovered since. So far, therefore, there certainly was an ignorance of facts; but I do not think we can justly accuse the Greeks of neglecting facts; but, on the other hand, we see by their works that they were most sedulous in collecting and arranging all that they then knew: and this opinion is expressed by Dr. Whewell. He says—“I will first notice some errors which may naturally occur to the mind as possible causes of failure, but which we shall be able to show were not the real reasons in this case. The cause of failure was not the neglect of facts.” “I conceive,” he says, “it may be shown that the Greek philosophy did in its opinions recognise the paramount value of observations, did in its origin proceed upon observed facts, and did employ itself to no small extent in classifying and arranging phenomena.”† Again, he says—“Since, as we have said before, two things are requisite to science—facts and ideas; and since, as we have

* History of the Inductive Sciences, by the Rev. W. Whewell, M.A., vol. i. p. 73: Parker, 1837.

† Ibidem, vol. i. p. 73.

seen, facts were not wanting in the physical speculations of the ancients, we are naturally led to ask, were they then deficient in ideas? was there a want among them of mental activity and logical connection of thought?" "But," he continues, "it is so obvious that the answer to this inquiry must be in the negative that we need not dwell upon it." . . . "We come back again, therefore, to the question, what was the radical and fatal defect in the physical speculations of the Greek philosophical schools? To this Dr. Whewell answers—"The defect was, that, although they had in their possession facts and ideas, the ideas were not distinct and appropriate to the facts. There can be no difficulty in conceiving that for each class of facts there is some special set of ideas, by means of which the facts can be included in general scientific truths, and that these ideas, which may thus be termed appropriate, must be possessed with entire distinctness and clearness, in order that they may be successfully applied. It was the want of such ideas, having a reference to material phenomena, which rendered the ancient philosophers, with very few exceptions, helpless and unsuccessful speculators on physical subjects."* That something in addition to facts and ideas was needed is readily proved by referring to some of the simpler problems in mechanics and dynamics which the ancients failed to solve, yet upon which they possessed all the facts which have since enabled philosophers with a more appropriate set of ideas to solve without difficulty. But to this deficiency of appropriate ideas must, I think, be added the following explanation of the failure of ancient philosophy, which includes the deficiency pointed out by Prof. Whewell, and goes far to explain its cause. The labours of the ancients were directed to a different end from that which we desire to reach; they bent their bows with vigour, but pointed their shafts in a direction distant from the mark which should have been their aim, and let them fly at one which could never be attained. In his essay on Bacon, Mr. Macaulay has illustrated this with his usual aptness. "In truth," he says, "the very admiration which we feel for the eminent philosophers of antiquity forces us to adopt the opinion that their powers were systematically misdirected. For how else could it be that such powers should effect so little for mankind? A pedestrian may show as much vigour on a treadmill as on the highway road. But on the road his vigour will assuredly carry him forward, and on the treadmill he will not advance an inch. The ancient philosophy was a treadmill, not a

path. It was made up of revolving questions of controversies, which were always beginning again. It was a contrivance for having much exertion and no progress . . . "Where this philosophy was in the time of Cicero, there it continued to be in the time of Seneca, and there it continued to be in the time of Favorinus. The same sects were still battling with the same unsatisfactory arguments, about the same interminable questions. There had been no want of ingenuity, of zeal, of industry; every trace of intellectual cultivation was *there except a harvest*."* Neither did the ancient philosophers neglect the study of natural science, "but they did not cultivate it for the purpose of increasing the power and ameliorating the condition of man."† "It was considered in the light merely of a mental exercise."‡ "It was made subsidiary to the art of disputation, and it consequently proved altogether barren of useful discoveries."§ From this general censure even the Epicureans cannot be excepted, for, notwithstanding the high value which they placed upon mere sensual enjoyments, referring all happiness to bodily pleasure, and all evil to bodily pain, they neither exerted themselves to better their own physical condition, nor expected any more improvements in the arts which conduce to the comforts of life.

"Ad victum quæ flagitat usus
Omnia jam ferme mortalibus esse paratâ"

were the words of their great poet.

Supposing, therefore, that the ancients had possessed a sufficient number of facts, and a sufficient number of ideas, and even the mental power necessary to give these ideas an appropriateness to the fact; having set up as the goal of their philosophy a castle in the air, we can readily understand that to us, who seek for the temple built upon a rock, their ideas must appear perfectly inappropriate.

These appear to have been the radical and fatal causes of failure in the ancient philosophy, when applied to *subjects upon which all the necessary facts were possessed*; and satisfactorily explain how it happened that such powerful and active minds drew no new truths from the same sources which have since yielded luxuriant harvests. But we must not forget that *deficiency of facts themselves was on most subjects a sufficient obstacle to the discovery of new principles*, and that in medicine and surgery this was particularly the case. Therefore we must assign these several, though intimately

* Lord Bacon. Critical and Historical Essays, by T. B. Macaulay. London, 1851.

† Ibid.

‡ Ibid.

§ Ibid.

* Ibidem, vol. i. p. 79.

connected causes, for the failure of the Greek philosophy—

1st. A mistaken notion of the proper objects of philosophy.

2d. A deficiency of facts on most subjects.

3d. A deficiency of appropriate ideas connected with the facts possessed.

It will be shown, at a future page, when I treat of the past and present state of medical science, that the deficiency of correct facts was certainly immense in this department of knowledge; and the circumstance already referred to—of the “philosophical period” being immediately followed by the “anatomical,” in my opinion confirms the correctness of this assertion. I wish to call particular attention in this place to the fact, that although the Greek philosophy failed to produce new truths in medical and surgical knowledge, and therefore failed to attain its proper object, yet it contributed largely to the advance of our science in the end. And the manner in which it did so was this:—*It caused to be brought together the facts then possessed in medicine and surgery*: this being done, the philosophers who failed to draw new truths from them discovered that they had not yet the materials for their philosophy: that they were deficient in the necessary facts. They thereby pointed out to the world what were the necessities of the sciences they studied. It is evident that the want of a proper object, and of appropriate ideas, would not be detected by the philosophers in whose minds the deficiencies existed; but the absence of facts would be even exaggerated by them, in their endeavour to account for their ill success. Succeeding ages have discovered that the cause of failure was compound, but the sages of the “philosophical period” proclaimed the absence of sufficient and correct facts; and they were answered by the succeeding generations in the attention then devoted to anatomy. Hence we see that the effect of the “philosophical period” was the ultimate advancement of medical science.

The next support we gain from experience in the past is from observation of the manner in which discoveries have been made: this is a part of the subject replete with interest, but, unfortunately, one which would occupy so much space, if treated at length, that it must be here passed over unsatisfactorily—only a few illustrations being given. Empedocles, a philosopher, poet, historian, and physician of Agrigentum, in Sicily, by the skill which he possessed in medicine and in natural philosophy was enabled to perform many feats, so wonderful, in that time, that he

passed them upon the minds of the superstitious and credulous multitude as miracles; so that when he appeared at the Olympic games he became an object of universal attention. From time immemorial pestilential fevers had periodically ravaged his native city. He observed that the appearance of these fevers coincided with the return of the south-east wind Sirocco; and the constancy with which the return of the Sirocco was followed by the appearance of the pestilence, led Empedocles, accustomed as he was to philosophise, to connect the two facts in his mind by an act of reason, and to conclude that the pestilence was caused by the wind. From this point he proceeded to the next step in his reasoning,—that to remove the wind from Agrigentum would put an end to the fevers: he accordingly had a wall of great height built round the south-east side of the city, with the desired effect; and it is reported, by M. Brayer, in his work on Constantinople,* that the wall still stands, and that Agrigentum is free from pestilence. This fairly exemplifies the discovery of the cause of disease by inductive reasoning.

The circumstance of discovering that diseases might be caused by states of the atmosphere, directed the ideas of Empedocles into an improved course; and we shall see by the following anecdote that certain facts being presented to him, they found in his mind appropriate ideas, and the essentials of philosophic reasoning being established, he was successful in their application. The inhabitants of the city Selinus, in Sicily, were a prey to an endemic disease, and having heard of the fame of Empedocles they begged he would liberate them from what they considered to be a curse. The philosopher accordingly visited Selinus, his mind lately impressed with the fact that the atmosphere may become a cause of disease, and his ideas all influenced by the new discovery. Upon visiting the city his first care was to make himself acquainted with every fact relating to it; and the working of his mind must have been something after the following manner:—He had failed to discover any coincidence between the appearance of the disease and any particular wind, but still he returned to the idea of an atmospheric cause, and he remembered that the air is an influence to which all are alike exposed, therefore any effect produced by it will be common to all; and the endemic in question he found to be universal. But, he must have continued, the natural air is not injurious to health; therefore it must

* Neuf années de séjour à Constantinople, par le docteur Brayer.

contain some foreign property to render it a cause of disease. This is possible, as in the case of the Sirocco wind at Agrigentum: but there is no particular wind to refer to in this case; therefore, if the air be impure, from what source is it infected? Seeking again for some new fact in answer to this question—some existing source of impurity—the only object which arrests his attention is the river Selinus surrounding the city:—he observes that the current of this river is so slow that the waters become stagnant; that its banks are thickly covered with vegetation, and that the stream is clogged with decaying matters: here, he fancies, may be a source of the impurity; for the vapours from the putrid river may rise and infect the air. Still something is wanting to complete the proof in his mind. He makes further observation; discovers that during the summer months the river's current is impeded, and the gases rising from it unusually abundant: he finds by inquiring that there is a coincident augmentation in the severity of the disease at these periods: he recollects the coincidence between the return of the Sirocco and the return of the pestilence, and decides at once that the cause of the endemic at Selinus is the slow current of the river in its neighbourhood. And it is a fact in history that Empedocles had two other rivers conducted into the bed of the Selinus; its current was thereby accelerated, the stagnant vapours ceased to rise, and the endemic disease never returned. This, again, is a simple but correct example of the discovery of the cause of disease by inductive reasoning.

It may not be generally remembered that the discovery of the circulation of the blood was entirely an inductive act, depending wholly upon the philosophic tendency of Harvey's mind, and its application to facts already known. Aristotle observed that the termination of the veins was in the heart. Galen remarked the anastomoses between veins and arteries through the capillaries. Sylvius observed the existence of valves in the veins. Servetus and Realduus Columbus discovered that the communication between the right and left sides of the heart was through the lungs. Andrew Cæsalpinus remarked the swelling of veins below ligatures, and inferred from it a reflux motion of the blood in these vessels. Fabricius observed that the valves of veins all turned towards the heart—was acquainted with the existence of valves in the heart, and the absence of valves in the arteries—yet he did not discover the circulation of the blood, and still held the absurd notion that the arteries were filled with air, or "vital spirit," as it was called. The

glory of discovering the circulation was left for William Harvey. "So true is it," says Cuvier, "that we are often on the brink of a discovery without suspecting that we are so." "So true is it," observes Dr. Whewell, "that a certain succession of time and persons is generally necessary to familiarise men with one thought before they can advance to that which is next in order." The course of the discovery is thus described by Professor Whewell:—"William Harvey, after making his studies at Cambridge, went to Padua, and became a pupil of Fabricius. In this city, excited by the discovery of the valves in the veins, which his master had recently made, and reflecting on the direction of the valves which are at the entrance of the veins into the heart, and at the exit of the arteries from it, he conceived the idea of making experiments in order to determine what is the course of the blood in its vessels. He found (as Cæsalpinus had done) that when he tied up veins in animals they swelled below the ligature, or in that part farthest from the heart, while arteries with a like ligature swelled on the side *next* the heart. Combining these facts with the direction of the valves, he came to the conclusion that the blood is impelled by the left side of the heart in arteries to the extremities, and thence returns by the veins into the right side of the heart. He proved also that the circulation of the lungs is a continuation of the larger circulation, and thus the whole doctrine of the double circulation was established." Thus we see it clearly illustrated that observation alone is not sufficient for the discovery of causes of disease, or of principles in science. The discovery of the circulation of the blood is due to an act of inductive reasoning excited in the mind of Harvey by a review of numerous facts *already well known*.

Cuvier's application of the principle of the conditions of existence in animals* is another example of discovery, the result of reasoning upon collected facts.

I must now pass on to the third and last of the sources of support under consideration—viz., a comparison of the state of knowledge and of the human intellect at the present time, with their state in the "philosophical period." The object of such an examination may be readily demonstrated. I have stated it to be my persuasion that great progress in medicine and surgery may be made in the present age by the application of inductive reasoning. I have pointed out that, although the philosophy of the ancients in these branches of

* "Theory of the Earth."

knowledge was in the end to their advantage, yet that it completely failed to attain its proper object of producing new truths. I have also shown the causes of this failure. It is my duty, therefore, to explain my reasons for expecting, in the present day, such great success from the same source which proved fruitless in a past age. Knowledge is the material, and the human intellect the ruling power, by which combinations and changes in the material are to be directed. Knowledge and the human intellect are, therefore, the two elements from the combined action of which we expect the production of new truths; hence it is proper to compare the condition of these elements in the present day, with their condition in the days when their combined action failed to produce those truths we now expect from them. Professor Whewell says, "to the formation of science two things are requisite,—facts and ideas, observation of things without, and an inward effort of thought; or, in other words, sense and reason. Neither of these elements, by itself, can constitute substantial general knowledge. The impression of sense unconnected with some rational and speculative principle can only end in a partial acquaintance with individual objects. The operation of the rational faculties, on the other hand, if allowed to go on without a constant reference to external things, can lead only to empty abstractions and barren ingenuity. Real speculative knowledge demands the combination of the two ingredients—right reason, and facts to reason upon.* I must attempt to show what supply of facts on subjects connected with medicine and surgery there was in the "philosophical period," and what is the comparative supply of facts on these subjects at the present day.

It is curious to observe, that, during the whole history of medicine and surgery, comprising a lapse of more than 3000 years, there has been only one period characterised by attempts at philosophy; and that this period lasted only 180 years. Some idea of the collection of facts then possessed may be gained by observing the date of this epoch, and what had been the character of those which went before. Now it will be remembered that, according to the plan which I have adopted, the history of medicine and surgery is divided into eight periods. The "philosophical" forms the third of these, the third of the four epochs which constitute the first age, or "age of foundation." The space of time previous to the attempts at inductive rea-

soning was not very ample for the observation and collection of correct facts. Of the two periods which precede the "philosophical," the first is the "instinctive," and comprises an indefinite number of years; in the beginning of which, through the influence of that instinct which, as Plato says, "teaches men to flee from sorrow and death," the art of healing was conceived, and during which it reached a certain stage of development in its embryo existence. The second is the "mystic or sacred," and includes the days when the practice of medicine was in the hands of the priests, and exclusively confined to the temples, the law of the Asclepiades being that "it is not permitted to reveal the holy things to any but the elect, and that strangers are not to be admitted to this knowledge until they have submitted to the trials of initiation." The treatment employed by the Asclepiades was prescribed upon no safer grounds than those of the purest empiricism, their only guide being what little experience they had at command, and having continually in their mouths, as an historian has said, these words, "I have seen quite a similar disease cured by such or such a remedy;" this reasoning being based upon an incontestible principle, viz., that any medicine which has cured a disease ought equally to cure maladies analogous to the first. But when we come to learn *what* means, *what* evidence they had, from which to decide upon the identity of diseases, or the similarity between two disorders, we shall see how likely the doctrine was to answer in its application. The records of all diseases treated by the Asclepiades were inscribed on tablets, at first hung about the walls of the temples, and afterwards arranged in classes for more convenient reference. Some idea of the contents of these tablets has been gained from one of them found at Rome, in an island of the Tiber, formerly the site of an Æsculapian temple. The following are some of the inscriptions which were engraved on the tablet:—"These last days a certain Caius, who was blind, having come to consult the oracle, the deity answered, that he must first prostrate himself before the sacred altar, to make his adorations. Then he passed from the right to the left, and having stretched his fingers upon the altar he raised his hand, and applied it to his eyes. He soon recovered his sight in the presence of the people." 2. "Lucius was attacked with a pleurisy, and everybody despaired of his life. The deity of the temple ordered him to take some cinders from the altar, to mix them with wine, and to apply it to his side. He was saved, and returned thanks before the

* Professor Whewell, op. cit., vol. i. p. 6.

people." 3. "Julien ejected blood from the mouth; he appeared beyond hope: the oracle ordered him to take from the altar some pine seeds, and to eat some honey for three days. He did so and was cured, and having returned thanks he went his way." 4. "The deity gave this order to a soldier, named Valerius Aper, who was blind: 'Take some blood of a white-cock, mix it with some honey, and make a collyrium; with which bathe your eyes during three days. The soldier having obeyed the orders of the oracle, recovered his sight."

Such is a specimen of the ancient mode

of taking cases, as far as may be judged from the temple tablets. Some historians have presumed that the Asclepiades kept private notes in a more careful way, but of this we have no proof. The amount of knowledge to be gained from such as I have quoted is very easily calculated. It is well attested that the priests did employ purgatives, emetics, baths, frictions, and mineral waters, but their principal confidence was placed in the good effects of the pure air of the localities in which the temples were built, the careful regimen, and the mysterious influence of the deity, *Æsculapius*.

CHAPTER V.

Comparison of the state of knowledge and of the human intellect at the present time with their state in the "philosophical period," concluded—Four sources of fallacy to be guarded against in making this comparison—The results of such a guarded comparison.

THE facts which would be most important to the discovery of the causes of disease, are those in anatomy, physiology, and morbid anatomy. I know no better medium through which to gain an idea of the state of knowledge in these matters, than an examination of that possessed by Hippocrates and his cotemporaries, who lived in the "philosophical period," and therefore had the knowledge of the one which preceded it. MM. Littré and Renouard have taken especial pains to ascertain this point, and I think, therefore, that I cannot do better than quote the result of their labours. M. Renouard says: "neither Hippocrates, nor his descendants, ever dissected human bodies; the religious respect which they had for the dead, throughout Greece, prevented it. It is difficult to find in their writings even some general idea of the form, volume, and respective position of the principal viscera. Osteology alone is treated with any accuracy; and this fact has been explained by a tradition, which says, that the Asclepiades of Cos preserved in their school a human skeleton for the instruction of their pupils. They had been able, moreover, to acquire some knowledge of internal parts by examining victims, in dressing wounds by which the visceral cavities had been opened, and by dissecting animals. Such are, according to the opinion of nearly all historians and critics, the sources from which the members of the Hippocrates family had been able to draw their anatomical knowledge."* But M. Littré denies that Hippocrates had ever dissected animals, or that he had in his possession a true skeleton. "Physiology, as we understand it at the present day,—that is to say, that branch of the science of man which is concerned in describing the functions of each organic texture,—could not possibly make any steps without being guided by the lights of anatomy. It is not astonishing, therefore,

that we can scarcely find any traces of it in the works of Hippocrates."*

Such, then, is a slight sketch of the condition of knowledge in anatomy and physiology at the time when men began to attempt philosophical reasoning in medical science; and it scarcely needs observing that if the natural conditions of parts, and their functions during health, were not understood, it was impossible that the changes of disease, and the consequent deviations of function could be appreciated; therefore morbid anatomy must have been even less understood than the anatomy and physiology of health.

We have to make a comparison between this state of things and the present condition of knowledge upon similar subjects. In the first place we observe, that while the philosophical period was only the third in the history of medicine, there have been no less than five periods since that time. Whatever knowledge has been gained during these twenty-one centuries has of course been added to that possessed at the epoch referred to. It is particularly to be remembered that the first part of this time was characterised by the discoveries of Galen and his followers, and was so peculiarly rich in anatomical improvements as to have gained the title of the "anatomical period." And it is well known how much anatomy, physiology, and pathology, have been studied in later years. As I have not space for a minute and lengthy analysis, I think I cannot adopt a more just method of comparison, than that of taking the works written on the different subjects during the present age, and during or before the "philosophical period". What comparison can there be between the anatomical works of Hippocrates, or Herophilus, or Aristotle, and those of Cruveilhier, Harrison, Quain and others? Or, in comparative anatomy, how shall we compare Aristotle's "Nine Books on Animals" with the works of Hunter, Müller, Marshall Hall, Paget, Todd, Carpenter, Baly, &c. &c. In morbid anatomy I might refer to parts of Hippocrates, but it would be too ridiculous to compare the writings of any of the ancients of that date on this subject with the modern works upon the same,—with Cruveilhier, Carswell, or Rokitsky; and still more

* Renouard, op. cit.

* Ibid.

ridiculous to compare the knowledge of the ancients with the yet unwritten knowledge of morbid anatomy possessed in our own time. Or let us turn to surgery. I am at a loss to find any work containing sufficient surgical knowledge to render it worthy to be compared with the works on surgery of the present day. What comparison can the Aphorisms of Hippocrates bear with Cooper's Dictionary; the "Cyclopædia of Practical Medicine;" "l'Encyclophonie générale de la Médecine;" or with the medical works of Watson, Laennec, Graves, Latham, &c.—Hippocrates' "Airs, Waters, and Places" with modern books on similar subjects? Or the works on clinical medicine which were the best of those published before the christian era, how little they will bear comparison with those of the present day. It is not necessary to multiply examples any further; it must be evident to those who have perused the works of the ancients and of the moderns, or paid a careful attention to the subject, that the difference between them is immense,—is such as would be expected to be worked during twenty centuries: that whereas at the time of the philosophical period there were but a few well attested facts in anatomy, physiology, and pathology, the amount of facts now existing is too large for us to form any just estimate of their number,—a number greater than it is possible for us to calculate or make use of in their present scattered condition.

The second element of science, viz., ideas—the inward effort of thought—must now be considered: we must examine the comparative conditions of the human intellect at the present and at the "philosophical period." We cannot, of course, do this generally; the subject is too extensive for the present space. We must be content to confine our examination to the state of the intellect with respect to the subject under immediate consideration—the power of producing ideas—and, as it has been before stated, of appropriate ideas.

Facts and ideas, or sense and reason, are perfectly distinct from one another—the one can in no case be a substitute for the other, but they are in many cases inseparably connected. Facts cannot exist in the mind without ideas—we cannot become conscious of an object of sense without having an idea of sensation; therefore, if every fact is necessarily connected with a certain number of ideas, it is evident that an increase of facts is attended with a corresponding increase of ideas; consequently, having proved an increase in the number of facts possessed in medical and surgical subjects, we have also proved an increase in the amount of attendant ideas. But, although sensation is necessarily at-

tended with ideas, ideas may be the product of the mind, independent of sensation. It is possible, therefore, that two periods of time being given, the one characterised by a large number of facts, the other by a small number, the period containing the larger number of facts may possess the smaller number of ideas, and also the converse of this—the mind being more active in the period characterised by the smaller number of facts, than in that having the larger number. Therefore, before we can decide whether ideas are more numerous in the present age than they were in the philosophical, it must be ascertained what is the character of the human intellect with respect to the power of producing ideas independent of sensation. This is a question of great difficulty, because open to so many sources of fallacy, among which may be mentioned the following:—1st, the great difference between the facilities now offered of recording ideas, and those presented in the earlier ages of the world. This is a very important consideration, because we have scarcely any other mode of judging the minds of the ancients than that of observing their works. These were produced at immense cost and labour; therefore they were more limited, and it was more difficult for a philosopher to record his ideas than in the present day: added to this we must not forget how many of the choicest works of authors who lived before the year 320 B.C.,—of the very authors we are now considering, have been destroyed. The circumstances of the case, then, dispose us to attribute fewer ideas to the ancients than they might have possessed; while, on the other hand, the circumstances of the present day dispose us to appreciate fully the amount of ideas possessed in the age in which we live. This source of fallacy must be remembered: 2d, we must observe that each age is marked by some change in the character of the ideas most numerous in it: there is a particular character to the ideas prevalent in each period. It will readily be conceived that some ideas require a much more powerful effort of thought for their production, some an effort much less powerful; that the degree of power requisite for the production of an idea will correspond to the character of the idea. The same mental power, therefore, which would produce one idea of a certain character, might produce ten or more of some other, or might not be sufficient to produce one idea of a third character, and in the latter case would fail to leave any record of its having existed at all. Hence it is clear that not only the number of ideas, but the character of those ideas, must be ascertained before it can be determined what capacity there was in the

human intellect at any particular period for producing ideas. I believe that our knowledge of the comparative amount of mental effort necessary for the production of different ideas, is so imperfect, that this is, at present, an unavoidable source of fallacy in our computation of the condition of the human intellect with respect to its capability of producing ideas at any required period.

3. It appears to me that there is this further source of fallacy in the present matter: the degree of mental power required to form a new idea must be far greater than that needed to understand and adopt an idea of equal value already formed by another intellect; and this brings us to the necessity of distinguishing carefully between original and adopted ideas. In proportion as we turn to more and more remote periods in the history of man, as we approach nearer to his first creation, out of any given number of ideas taken from the general mass the amount of original ideas will be greater; therefore, although the whole number of ideas possessed at any given time might be less than at the present period, yet the number of new ideas therein might be much greater: so that we have not only to distinguish the character of the ideas, and the degree of mental power necessary to that character, but also to distinguish between original and adopted ideas. Again, I apprehend there is this fourth source of fallacy. Whatever be that property of the human intellect which is necessary to the production of an idea, that property, the strength of which determines the power with which ideas are formed, would seem to be the same that is required for the *adoption* of an idea; understanding by "adoption" that the idea of one mind be added to the possessions of another. I am not prepared, at present, to state this as a certainty; but supposing it to be the case, we may imagine that the power which would be sufficient to produce one idea would be adequate to the adoption of several: it is evident if the same power be expended in the formation as in the adoption of ideas, that, in proportion as human knowledge accumulates—as the amount of ideas adopted increases—there must either be an increase of mental power or a diminished capacity in each mind for the production of new ideas. This source of fallacy would act in a contrary direction to those before stated, while they expose us to the danger of depreciating the power of the human intellect in former days; the last circumstances mentioned, on the other hand, dispose us to undervalue the power of the human intellect in the present day.

It is evident, from these considerations, that it is extremely difficult to determine the relative power of the mind to produce

ideas in different ages of the world. Notwithstanding, however, all these difficulties and sources of fallacy, I firmly believe that a careful review of the history of human knowledge, a careful comparison of periods, is correct, in leading us to the conclusion, that, in the present period, there is a very great power of producing ideas—a power very equally spread among civilised people—much greater in amount than that possessed in the period called "philosophical." We have, therefore, an increased amount of facts,—an increased supply of ideas attendant upon these facts,—and an increased power of creating new ideas. Hence we find the two elements of science—"facts and ideas"—or sense and reason, possessed by civilized man in the present age. One other point in connection with this has yet to be determined; viz., who far the ideas are appropriate to the facts—how far that which Prof. Whewell considers to be the chief cause of failure in the Greek schools of philosophy is remedied in the present day. Unfortunately this is, like the last, a subject on which a whole treatise might be written, and yet leave the question imperfectly answered; it is one, therefore, almost impossible to treat in the present place. The proper course to be pursued in determining this matter would be, to take a certain number of general truths—to observe every fact concerned in the process of their induction—to ascertain the exact number of minds which had reviewed these facts with the desire to reason upon them; to ascertain the result of the review taken by each of these minds; to set down all these points in order, and to place beside them all the circumstances surrounding each individual at the time his mind was directed to the facts in question: having done this with a certain number of truths discovered in one period of the history of science, to repeat the process with a similar number taken from each period, from the commencement of the history down to the present day. I believe that the result of such an examination of the subject would be a tolerably correct notion of the comparative appropriateness of ideas to facts, in the present and past ages. This plan cannot be followed out here, but by adopting it I believe that we shall find the ideas of the present period are far more appropriate to the facts possessed than they have ever been before, and this particularly as relates to medical and surgical subjects. An improved knowledge of what is right necessarily leads the mind towards a more correct idea of what is wrong: thus the important improvements in a knowledge of the anatomy of parts during health must lead the mind towards a more correct idea of what is altered under con-

ditions of disease. A knowledge of healthy actions must lead the mind towards a right course of ideas concerning deviations from healthy actions : thus the late great additions to a knowledge of the physiology of healthy textures must render ideas concerning that of unhealthy textures more appropriate. A knowledge of the circumstances under which certain known processes arise, will direct the mind to the formation of a more appropriate set of ideas, when certain circumstances are presented, and it is required to know what processes will coexist with them. An acquaintance with the circumstances attending a state of health in the body, with the processes then going on, and with their effects, will lead the mind to an appropriate set of ideas when it is required to discover the cause of changes in these effects. Therefore, the present condition of knowledge in anatomy, physiology, and morbid anatomy, renders the ideas connected with the facts presented by diseases more appropriate than they could possibly have been when this knowledge was less complete.

A very prolific source of support to my assertion that ideas at the present day are more appropriate to facts than they were in by-gone ages, may be found in an observation of the experiments performed in different branches of scientific investigation at the present and in remote periods. Compare, for example, the experiments of chemists—those of Davy, of Faraday, or Liebig, so well planned—so well directed for the discovery of the desired truth, and therefore suggested by such an appropriate

set of ideas—compare these with the vague, unreasonable, and objectless experiments of alchemy. Take Mechanics, for a second example: compare the attempts made at the present day, when it is desired to discover new powers, or new applications of powers in machinery, with the blundering attempts of the ancients (with a few memorable exceptions) to do the same things, and we can but notice how peculiarly appropriate the ideas are to given facts in the present day: the effect of this is seen in the number of new applications and new directions given to mechanical forces. I might point to a third example, among Arts and Manufactures: do we not see an evidence of appropriateness of idea in the readiness with which demands are answered when the discovery of any new article in these provinces is called for, and in the admirably appropriate form in which it appears, exactly suited to the necessities of the case? I believe we shall find no stronger or more marked confirmation of the truth, that facts in the present age are associated with ideas far more appropriate than they have ever been in past days, than the disappearance of superstition from the human mind presents us with. Superstition appears to be a result of the association of inappropriate ideas with the objects presented to the senses, and, as more appropriate ideas are formed in the mind, superstition ceases to exist. The difference with respect to the prevalence of superstition observable in the periods prior to the “philosophical,” and in that epoch itself compared with the age in which we now live, is peculiarly striking.

CHAPTER VI.

The philosophy of Bacon contrasted with that of the ancients—difference of object—additional reasons for expecting success from the application of philosophy to medical studies—Treatment of disease—the knowledge necessary before it is attempted—Means of discovering the effects of new medicines and operations—The attributes of a true experiment—its proper place in scientific researches—Enumeration of four of the conditions essential to improvement in Medicine and Surgery—The fifth essential condition considered—Answer to the question “How shall we improve our profession?”—The reasons why this improvement has not been already effected—why it cannot be until some preparation has been made—the nature of this preparation—a prelude to an inductive epoch—Especial attention directed to this part of the subject.

I HAVE now endeavoured to show that there are, at the present day, the conditions necessary for inductive reasoning in medicine and surgery,—that there are facts and ideas, and that the ideas are, to a great extent, appropriate to the facts. But I have reserved for this place an all-important portion of the subject; considerations which add the most powerful arguments in favour of those already adduced.

Among the causes of failure in the philosophy of the ancients, “a mistaken notion of the proper objects of philosophy” stands foremost. I have asserted that their goal was a “castle in the air,” and it was during the period when this mistaken object was aimed at, that medicine and surgery were made the study of philosophers. Since then, the noble work of Baconian philosophy has been building “the temple on the rock.” We cannot consider that philosophical reasoning has ever been employed to a large extent upon the science of medicine, when we compare the objects sought after in the philosophical period with those which now are held to be worthy of the emulation of our reason. “The chief peculiarity of Bacon’s philosophy,” says Mr. Macaulay, “seems to us to have been this; that it aimed at things altogether different from those which his predecessors had proposed to themselves. This was his own opinion. ‘Finis scientiarum (says he) a nemine adhuc bene positus est’*. And again, ‘omnium gravissimus error in deviationem ab ultimo doctrinarum fine consistit:’† ‘nec ipsa meta,

says he, elsewhere ‘adhuc ulli, quod sciam mortalium posita est et defixa.’* The more carefully his works are examined, the more clearly we think it will appear that this is the real clue to his whole system, and that he used means different from those used by other philosophers because he wished to arrive at an end altogether different from theirs.”† “What, then, was this end which Bacon proposed to himself,” continues Mr. Macaulay. “It was, to use his own emphatic expression, ‘fruit.’ It was the multiplying of human enjoyments, and the mitigating of human sufferings. It was ‘the relief of man’s estate.’‡ It was ‘commodis humanis inservire.’§ It was ‘efficaciter operari ad sublevanda vitæ humanæ incommoda.’|| It was ‘dotare vitam humanam novis inventis et copiis.’¶ It was ‘genus humanum novis operibus et potestatibus continuo dotare.’** This was the object of all his speculations in every department of science, in natural philosophy, in legislation, in politics, in morals.”†† “Two words form the key of the Baconian doctrine,—utility and progress. The ancient philosophy disdained to be useful and was content to be stationary.”‡‡

Since the establishment of the Baconian doctrine no philosophical period has returned to the science of medicine. The materials for this event have been accumulating rapidly; but while other branches of science have been gathering in their rich harvests, medicine has been passing its seed-time, and its days of fruit are yet to come; the causes of failure, when philosophy was formerly applied to it, are all more or less removed. The mistaken object has given place to a correct one. The deficient facts are being supplied—the inappropriateness of idea no longer exists. I am justified, then, in expecting successful results from philosophy, although it failed to produce them in former days.

It has been demonstrated that the causes and processes of disease require inductive reasoning for their discovery. The next portion of deficient knowledge in medicine and surgery we found to consist of “treatment”—the means of arresting processes or removing causes; and I must now offer some

* Cogitata et visa.

† Macaulay, op. cit.

‡ Advancement of Learning, bk. 1.

§ De argumentis, lib. 7. cap. 1.

|| De argumentis, lib. 2, cap. 2.

¶ Novum organon, lib. 1, aph. 81.

** Cogitata et visa.

†† Macaulay, op. cit.

‡‡ Macaulay, op. cit.

* Nov. organ. lib. 1, aph. 81.

† De argumentis, lib. 1.

observations on this point. Before setting about to remove causes we must learn what causes exist—before learning to treat a disease it is necessary to know what there is to treat. It is evident, therefore, that the part of the subject already disposed of is the most important to us at present:—believing it to be so, I have devoted much more time to discussing it than I can give to the part now under consideration. The treatment of diseases will consist of two parts—an attention to regimen and the administration of drugs or performance of operations. The application of the former—*i. e.* the regulation of diet, of atmospheric influences, of exercise to organs—the application of warmth or cold, and the like, may, to a great extent, be determined by the power of reason, when an acquaintance is gained with the facts of the case—the nature of the causes or processes then acting, and which it is desired to remove; because we know by experience the properties of the agents to be employed, and it only requires that they be applied with reference to these properties, and to those needed to arrest or remove the particular process or cause under consideration. The latter class of treatment—*i. e.* the administration of drugs or the performance of operations—is different from the former. If we consider only those drugs or operations well known, the exact properties and effects of which have been determined by experience, these stand in the same light as the means of treatment which I have, for convenience, included under the head of regimen; all that is needed for their due application being, that we know the existing causes requiring to be removed, and adjust those particular remedies to their removal known to be capable of effecting it. But it is far otherwise when we come to the discovery of new remedies, in the form of drugs or operations. It may have been imagined that I was about to propose the induction of facts in anatomy, physiology, and morbid anatomy, as a means of discovering new remedial agents. But I believe that nothing but experiment can lead to the discovery of new remedies, in the form of drugs, or to a certain knowledge of the effects of operations. Many experiments must be made, and the properties of the drug, or the effects of the operation, in a large number of cases, examined, and justly estimated: the result of such a course of proceeding will be a knowledge of the nature of the remedial agents.

Experiments made without some appropriate set of ideas to guide their direction are tedious or fruitless; and indeed do not deserve the name of experiments—although they may occasionally, by some chance, produce an useful effect, or reveal a new truth.

For an experiment to be worthy of that name it must be directed with careful judgment towards some particular object—it should be the means resorted to when reason has brought the mind to a point which unaided reason is not sufficient to decide. The result of the experiment will then definitely answer the question proposed. Now the only way by which an experiment can be rendered so appropriate is this; to know well the nature of the object to which the experiment is directed. If the experiment have for its object to ascertain whether a process can be arrested by the application of a given agent, it is clear that such processes must be distinguished and particularised, and all circumstances relating to each learned first, in order that the experiment may be appropriately applied. It is equally clear, if the experiment have for its object to learn the power of any agent in removing changes in a part, that the causes of these changes must be learnt before the experiment can be appropriately applied. Hence it is shown that, although the properties of remedial agents can only be ascertained by experiments, these necessary experiments cannot be made with hope of success except they be directed by a set of ideas appropriate to the facts of the case; and this appropriateness of ideas cannot be attained until the causes and processes to which the effects are due—concerning which experiments are made—have been ascertained by the induction of facts.

In the commencement of this paper certain conditions were laid down, stated to be those essential to improvement. I have since endeavoured to supply these conditions with respect to the science of medicine and surgery; with what success I have supported the numerous assertions I have been obliged to make, and have explained my own ideas, must be left for others to judge. But believing I have shown reasons for the conclusions at which I have arrived, and endeavoured to conduct the mind of my reader, I must now assume all but one of the essential conditions of improvement in medicine and surgery to be established. 1st, we have ascertained the condition of medical and surgical knowledge at the present time. 2ndly, we have formed an ideal standard of perfection in this knowledge. 3rdly, we have pointed out what parts are necessary to bring medical and surgical knowledge from its present condition up to that of our standard of perfection. 4thly, we have determined the means by which these parts may be supplied. The fifth condition still remains unsupplied, *viz.* the order in which the deficient parts may be safely supplied; and

to the consideration of this I will proceed at once.

The deficient parts consist of "an acquaintance with causes and processes," and of treatment directed to their removal or arrest. I have taken pains to show that the treatment of disease cannot be rightly applied until the causes and processes to which it should be directed are determined. The question, then, as to the order in which the deficient parts should be supplied, is answered in favour of the former. A knowledge of the causes and processes of diseased changes must be supplied first: an acquaintance with the treatment of them will follow. And now, after a dissertation so long, and I can but fear tedious, I have arrived at the point where the great and important question with which I commenced may be satisfactorily answered. The question was—How shall we satisfy that ambition which makes us anxious to improve our profession? What is the step in improvement which, being directed, we may boldly take? The answer is—to apply our intellects sedulously to inductive reasoning, and to direct this to medicine and surgery. This is the first step, by taking which we may discover the causes and processes of disease.

The following question naturally arises in this place: if the necessary parts for the improvement of medical science can be supplied by means apparently so simple, why have they not been supplied by some of the many great men whose names we reverence in the annals of medicine and surgery? It is certainly a question of great interest, for, that such a step has not been taken, would seem almost an argument that it would not be attended with success. But if we enter more carefully into the subject, I believe the difficulty will be explained, and we shall rather be disposed to feel more convinced that our conclusion as to the necessities of our profession is correct, from observing how many difficulties lie in the path of those who strive to supply those necessities; how many insurmountable obstacles have lain before some who would otherwise have been most capable of performing the task. I conceive that the first circumstance which has deterred men from proceeding to the step I now point out has been that strong impression, so universally retained, of the little good and the apparent amount of evil, which resulted from the philosophy of the ancients in its application to medical science, and the evil consequences which have so often resulted, in later days, from speculations in these matters. This impression, the correctness of which we are now prepared to judge of, is undoubtedly very general; and as the

actions of men's lives, and the course of their mental career, are guided by the reigning impression in their minds, we are not surprised to find that the idea of applying philosophical reasoning to medical science could not attain to a complete development. The second cause is the advance made in a knowledge of the essential conditions of inductive reasoning, and in the extended appreciation of the truth, that *deduction*, except as a successor to *induction*, is worse than vain. This advance in knowledge teaches men that it is impossible to reason correctly, or even safely, in physical subjects, on any other basis than the acquaintance with correct facts. The existence of this cause, why men have been deterred from philosophising, adds strength to the effect of the next, which I believe to be, *the incalculable number of facts possessed in medical and surgical subjects*. The science of medicine is one of the most complicated of all the sciences; it derives facts from so many sources,—from anatomy, from physiology, morbid anatomy, chemistry, mechanics, from disease in the living body, from the effects of treatment, from every possible influence by which man is surrounded in health or in a state of disease. The number of individuals who follow our science, or rather our profession, and who contribute to the records of phenomena, is greater, perhaps, than in any other science: it is among the oldest of the sciences. Thus we perceive all those circumstances connected with it which are calculated to add most abundantly to the accumulation of facts, and in proportion to the number of course is the difficulty of reviewing them increased. A fourth cause of the effect in question is to be found in the extreme difficulty of deciding among the numerous observations, which are really worthy of the name of facts, which are well attested, which may be depended upon as elements of inductive reasoning. And lastly, I must call attention to a most important consideration, viz. the class of men who follow this science. Who are they, but the physicians and surgeons? not, as in mathematics, the closet students who may devote hour after hour to following out some cherished idea—to gathering the ideas of others, or the phenomena recorded by their predecessors; not, as in astronomy, men whose days may be devoted to undisturbed study, or to the teaching of scientific principles, and their nights in quiet, calm meditation in the observatory, with the facts for their induction placed before them with no less brilliancy than the stars; not, as in metaphysics, men whose duty and whose daily task it is to think upon series of facts, and to teach the results of their

combinations. Those who follow the science of medicine are the same men who practise medicine or surgery as a profession : their time is amply filled, their mental activity amply exerted, and often wearied, by a repeated observation of certain facts, and the repetition of certain imperfect and hurried inductions. They have every opportunity of observing for themselves facts which have been observed before, again and again, by others ; and also, they have the opportunity of observing *new* facts, which in many cases they have not even time, and often not inclination, to record. To review those which others have collected is too frequently out of the question ; and I hold that after a physician or surgeon is involved in extensive practice it is *impossible for him duly to review recorded facts as they now exist, for where can he look for any catalogue of facts on any one subject which even approaches to completeness?* Works abound in almost every branch of our science, but we find that the amount of new facts in each is comparatively nothing,—some one or two, perhaps ; the rest are only new statements of those which have been stated again and again. To learn the real amount of recorded facts on any one subject it would be necessary to peruse every book ever written upon it, and to do this with such care as to distinguish and to gather from each those facts only which are new. Such a task is too tedious, too long, to be within the power of any man actively practising his profession, and surrounded by its necessary duties. We discover, then, from the consideration of this matter, more than ample reason why inductive philosophy has not been employed to supply the truths so grievously needed by the science of medicine. And we see plainly, that while the facts in our science, so immense in their amount, remain in their present scattered condition, much as we may wish for it—much as we may strive to obtain it, however clearly we may see its necessity and endeavour to supply it,—a philosophical period cannot be established in medical science.

It is with extreme pleasure that I reach this practical point, towards which I have especially directed my arguments, viz.—*The necessity for the separate collection of facts upon different subjects, in order that they may be reviewed with readiness, and thus render possible that philosophical reasoning which now cannot take place although the sufficient facts exist and be known.* Professor Whewell has made some observations which are very appropriate to this subject. He says : “thus invention, acuteness and connection of thought, are necessary, on

the one hand for the progress of philosophical knowledge, and on the other hand the precise application of these faculties to facts well known and clearly conceived. It is easy to point instances in which science has failed to advance, in consequence of the absence of one or the other of these requisites ; indeed, by far the greater part of the course of the world, the history of most times and most countries, exhibit a condition thus stationary with respect to knowledge. The facts, the impressions on the senses, on which the first successful attempts at physical knowledge proceeded, were as well known, long before the time when they were thus turned to account, as at that period. The motions of the stars, and the effects of weight, were familiar to man before the rise of the Greek astronomy and mechanics, but the ‘diviner mind’ was still absent ; the act of thought had not been exerted by which these facts were bound together under the form of laws and principles. And even at this day the tribes of uncivilized and half-civilized men, over the whole face of the earth, have before their eyes a vast body of facts of exactly the same nature as those with which Europe has built the stately fabric of her physical philosophy. But in almost every other part of the earth the process of the intellect, by which these facts become science, is unknown. The scientific faculty does not work—the scattered stones are, indeed, there, but the builder’s hand is wanted.”* Again, says the same author, “In tracing the progress of the various provinces of knowledge which come under our survey, it will be important for us to see that at all such epochs such a combination has occurred ; that whenever any material step in general knowledge has been made—whenever any philosophical discovery arrests the attention—some man or men come before us who have possessed in an eminent degree a clearness of the ideas which belong to the subject in question, and who have applied such ideas in a vigorous and distinct manner to ascertained facts and exact observations.”†

It must have been observed, that while I have stated that the most important part of the deficient knowledge in medicine and surgery may be supplied by an act of reason applied to facts, most of which are, on many subjects, already possessed,—while I have stated my conviction that our science requires a philosophical period to recur in its history,—yet I have taken pains to show that *the existence of such a period is incompatible with the state in which our*

* Op. cit. vol. i. p. 9.

† Op. cit. vol. i. p. 7.

knowledge exists at the present day. If these statements have been observed, I have doubtless been anticipated in this conclusion,—that it is our duty to devote ourselves to collecting the scattered facts, and, as it were, to make out a catalogue of those possessed in each particular department and subdivision of medical and surgical knowledge. To continue the comparison of Whewell,—to bring “the scattered stones” within the reach of the builder’s hand, that he may construct the edifice.

In speaking of the progress of knowledge, Prof. Whewell remarks: “these primary movements, when the inductive process by which science is formed has been exercised in a more energetic and powerful manner, may be distinguished as the inductive epochs of scientific history, and they deserve our more express and pointed notice. They are, for the most part, marked by the great discoveries and the great philosophical names which all civilized nations have agreed in admiring. But, when we examine more clearly the history of such discoveries, we find that these epochs have not occurred suddenly and without preparation. They have been preceded by a period which we call their

prelude, during which the ideas and facts on which they turned were called into action—were gradually evolved into clearness and connection, permanency and certainty,—till at last the discovery which marks the epoch seized and fixed for ever the truth which had, till then, been obscurely and doubtfully discerned.”*

It is this “prelude” to an inductive period that the science of medicine now requires, and the necessity for which I have endeavoured to demonstrate. One further and concluding remark on this subject must be made. It is to recall to memory the effect of the philosophical period of antiquity; that, although it failed to produce new truths, it benefited science by presenting a collection of the existing facts; thus pointing out what were the deficient materials, and exciting men to labour to supply these in the succeeding generations. We cannot doubt that in the present age any deficiencies thus pointed out would be supplied much more readily, and with far greater accuracy, than in the days of Aristotle or Galen.

* Op. cit. vol. i. p. 12.

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